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ABSTRACT

An exploratory study was designed to determine the amount and accuracy of symbol output that may occur in a fixed time when elementary school children are asked to copy from a page they have neither seen before nor will be given a chance to study. For two minutes, a total of 194 fourth, sixth, and eighth grade students copied an unfamiliar prose passage. The statistical differences between the means of each grade favored the higher grades for symbol output. The pattern that emerged for accuracy showed that sixth grade children made the fewest errors. At each grade level, girls were superior to boys in production and accuracy. (RL)

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THE EFFECT SIGHT COPYING HAS ON SYMBOL PRODUCTIVITY OF BOYS AND GIRLS

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Handcopying, far from becoming obsolete because of the omnipresent copying machine, remains an important skill for learning. Students continue to copy from the page, the chalkboard, and the screen in almost every class. At the junior and senior high school levels, about one third of students' writing output is copied and the amounts of copied letter output vary from under 15 percent for English to 98 percent for technical subjects (Fillion, 1975). One published program has been designed to utilize the student's copied work from an original printed passage to improve his composing abilities (Kunz and Viscount, 1973). In that program, a series of progressively more difficult passages first are copied and then are revised from the copied material. How long should it take an average eighth grade boy to copy the material from the page and revise from the copy? When a fourth grade girl is asked to recopy a two page composition to make a perfect copy, how many minutes will it take her to finish the task and how accurate will the copy be? Unfortunately, there is little information to help teachers establish time expectations for sight copying.

Speed of copying can be estimated from rate standards for handwriting tests. However almost all such tests give intensive prior practice with the target passages used for copying (Freeman, 1959; Herrick and Enlibacher, 1963). Such practice could cause speed standards to be spuriously high. That problem concerned Groff (1968), who replicated Ayres' study of 1917 because his standards for speed were then widely used, and continue to be used, in this era (Burns and Broman, 1979).

Ayres required his subjects to memorize the first three sentences of Lincoln's Gettysburg Address and then to practice writing the three sentences until they were familiar. Groff omitted written practice from his procedures and substituted oral reading of the sentences to gain familiarization and to identify unknown words. The difficult words were taught to individuals through oral practice until they were learned. The non-writing oral training adopted by Groff re-

sulted in a 34 percent drop in letter output, on average, across grades four to six. Groff believes his lower speed standards are more realistic. Even so, Groff had prepared his subjects for the copying task by teaching words, hence his subjects were not copying at sight. Sight copying is probably a more natural situation met by most students sometime during the school day. The purpose of this exploratory study is to determine the amount and accuracy of symbol output that may occur in a fixed time when boys and girls in grades four, six, and eight are asked to copy from a page they have neither seen before nor will be given a chance to study.

PROCEDURES

Sample

One hundred ninety-four boys and girls in grades four, six, and eight attending two predominantly middle class Catholic schools located about three-quarters of a mile apart in Saskatoon, Saskatchewan were tested.

Materials

A 216 word excerpt from a story (Wallin, 1972: 501) was Xeroxed and Xerox duplicated. The passage consisted of 953 print marks including both letters and punctuation marks. Measured with the Fry Readability Formula, the passage was estimated to have grade seven difficulty.

Testing

The test was administered in each classroom. Children were given the stimulus passage face down and a piece of foolscap. Students were free to select their own writing instrument. Identical instructions were read to each class. All questions about neatness were answered in the same way, "I have to be able to read each letter." Thus decisions about legibility were self-imposed. Timing was done electronically and copying, even if in the middle of a word, was terminated immediately at the end of two minutes when the alarm rang.

Scoring

Each paper received two scores -- one for productivity and one for error. (1) The productivity score summed all written symbols including departures from a prepared script such as additional letters, reversals, repeated words, or new words. Productivity, therefore, accounted for everything written, whether right or wrong. (2) Error was marked by circling or noting with a caret all deviations from the script including additions, omissions, and crossouts. An extra symbol in the word /truthfull/ truthful contributed nine to productivity and one to error. A reversal, /saw/ was received three for productivity, but added two errors to the total. Each error in the preceding examples was circled /Evry/ every added four points to productivity and one point to the error total. The missing /e/ was marked with ε caret.

RESULTS

Productivity

Table 1 shows that each higher grade is superior to the one before it; thus six is about 45 percent more productive than grade four and grade eight has about 45 percent more letter output than grade six. The ranges show that some fourth graders copy as fast as some eighth graders. The fastest fourth grader has about four times more output than the slowest one. Differences

INSERT TABLE 1 HERE

between the fastest and slowest copiers at the higher grades narrow, but the fastest more than doubles the output of the slowest. At each grade level, girls' output is greater than boys', averaging about 20 percent more across the three grades.

Table 2 shows that both grade and sex differences are highly important. A

INSERT TABLE 2 HERE

Sheffé test confirms that between grade differences are statistically significant. However odd-even grades, in all likelihood, do not fall right in between.

Data from Groff-Ayres (Groff, 1968) do show that grade five children are more productive than grade fours, but not as productive as grade sixes. Both studies concur the differences between fifth graders' and fourth graders' output are about 16 percent. Groff's results indicate grade five is 22 percent lower than grade six is; whereas Ayres' findings show only an 11 percent advantage for grade six. Thus grade five productivity appears to be different from the grades adjacent to it.

Error

Differences amongst the grades and between sexes for productivity suggested that comparing gross errors would not be useful. It seemed logical to divide productivity into the number of errors to obtain an error score for each subject and then to analyze the proportions of errors. Table 3 shows that grade six is the most accurate of the three grades and grade four children have

INSERT TABLE 3 HERE

the greatest proportion of errors. It is important to note that the grade fours were copying material three years above their grade level. Nevertheless, the average for the grade was slightly less than 95 percent accuracy.

Table 4 indicates that error differences among grades and between sexes are statistically significant. Individual scores reveal that 43 percent of the

INSERT TABLE 4 HERE

sixth graders and 41 percent of the eighth graders are error-free in performance; however only 15 percent of grade fours are perfect. The grade six and eight boys and girls who produced perfect papers were compared to those who made one or more errors. The check revealed that girls with zero errors had about one percent less productivity than those who made one or more errors. At the sixth grade level, the error-free boys are about seven percent less productive than those who were not perfect, but at grade eight level there is a discrepancy in letter output of 25 percent favoring those who made errors.

DISCUSSION

This study is in the nature of an exploration. The purpose was to obtain

benchmarks when children sight copy in contrast to the kind of copying for which prior practice is given. It is clear that sight copying is more variable within each grade than between grades, but differences between grades are very real. Not unexpectedly, boys and girls at a higher level show greater output than those at a lower level. Furthermore, at each grade level girls are more productive and more accurate.

Differences between sexes are always perplexing. Jackson (1963) wonders if culture can be ascribed as the cause for girls' superiority in handwriting. Rubin (1975) postulates that the early maturation of females gives them a headstart in learning to write. Is female superiority in sight copying, as revealed by this study, but another manifestation of girls' verbal superiority (Maccoby and Jacklin, 1974)? The findings of this study suggest that teachers can expect girls to copy about 15 percent more than boys in the same time. In all likelihood, their copy will be more accurate and more legible (Harris and Herrick, 1963). To what extent does memory for verbal content in which girls appear to have an advantage over boys contribute to performance? It was evident from observing copying that some children take large bites of information while others seem to check out each letter. What factors cause such differences in behavior? How can sight copying be experimentally manipulated to test reading ability?

Sight copying is not the same as copying used for handwriting measures. Table 5 compares this study's findings for grades four and six to findings from Groff's (1968) replication of Ayres' research. The scores represent three testing schemes: (1) memorization and written practice, (2) oral learning and (3) no prior practice. At grade four level Groff's and this study's

INSERT TABLE 5 HERE

results are very similar, but Ayres' are about 57 percent higher. To what extent

did Groff's oral practice and teaching of unknown words mitigate the effect his level of difficulty would have on these young children is open to conjecture. The output at grade six level favors Klein's sample by ten percent as compared to Groff, but both fall about 35 to 40 percent below Ayres' expectations.

Are the results from this study more realistic than either handwriting speed standards? As this is an exploratory study, the suggested rates must be confirmed by future investigation. A follow-up study is underway relating content difficulty to grade level.

TABLE 1

COPYING PRODUCTIVITY OF SYMBOLS FOR BOYS

AND GIRLS IN GRADES FOUR, SIX, AND EIGHT (TWO MINUTES)

	Grades 4		6		8	
Grade Mean	71.68	/79/	104.51	/69/	154/35	/46/
	(20.57)		(23.77)		(22.70)	
Grade Range	33 - 131		60 - 162		98 - 239	
Boys' Means (S.D.)	64.28	/39/	96.40	/35/	138.63	/19/
	(17.05)		(22.94)		(22.44)	
Girls' Means (S.D.)	78.90	/40/	112.38	/34/	165.41	/27/
	(21.11)		(23.26)		(20.74)	

TABLE 2

ANALYSIS OF VARIANCE BY GRADE AND SE FOR COPYING PRODUCTIVITY

(TWO MINUTES)

	SS	DF	MS	F	P
Grade (G)	191861.19	2	95730.56	183.99	.001
Sex (S)	15757.98	1	15757.98	30.29	.001
G x S	1125.65	2	562.82	1.08	.34

TABLE 3

PROPORTION OF ERRORS AS PERCENTS OF PRODUCTIVITY

FOR TWO MINUTES OF COPYING

	GRADES					
	4		6		8	
	%		%		%	
Grade Mean (S.D.)	5.4 (4.6)	/79/	1.5 (1.1)	/69/	2.0 (5.4)	/46/
Grade Range	0 - 19		0 - 7		0 - 11	
Boys Means (S.D.)	6.1 (5.4)	/3/	2.3 (2.3)	/35/	3.2 (2.7)	/19/
Girls' Means (S.D.)	4.7 (4.0)	/40/	0.7 (3.4)	/43/	1.2 (2.1)	/27/

TABLE 4

ANALYSIS OF VARIANCE BY GRADE AND SEX FOR PROPORTIONS OF COPYING ERROR (TWO MINUTES)

	SS	DF	MS	F	P
Grade (G)	183.47	2	91.73	9.80	.001
Sex (S)	83.55	1	83.55	8.92	.003
G x S	33.29	2	16.65	1.78	.17

TABLE 5

AVERAGE COPYING PER MINUTE BASED ON THREE STUDIES

(ADAPTED FROM GROFF, 1968)

Researcher	Testing Scheme	Material Level	LETTERS PER MINUTE	
			Grade 4	Grade 6
AYRES	MEMORIZATION AND WRITTEN PRACTICE	10	55.00	71.00
GROFF	ORAL TEACHING/ LEARNING	10	35.06	49.65
KLEIN	NO PRIOR PRACTICE	7	35.74	52.56

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